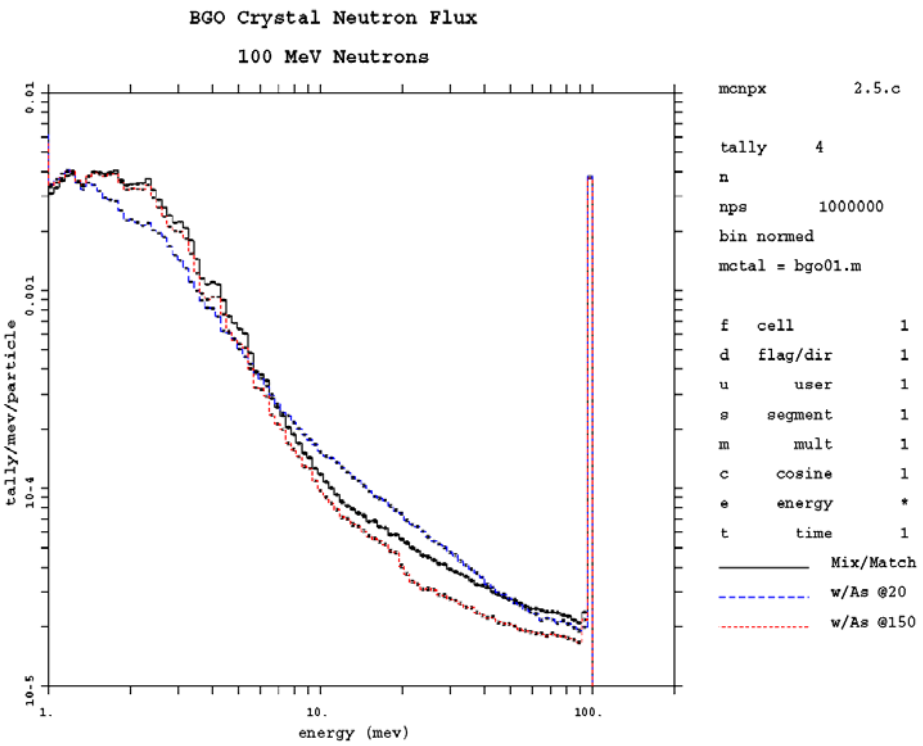

The BGO Crystal Neutron Flux illustrates:

- ✓ Using data tables (Bi and O) together with a physics model (Ge) when no data table exists for Ge;
- ✓ Using a neutron physics model (Ge) below 20-MeV;
- ✓ MCNPX mix-and-match capability.

The problem is a monodirectional 100-MeV beam of neutrons impinging on the base of a BGO crystal (21% bismuth, 16% germanium, and 63% oxygen.) The crystal is 8.433 cm long and 3.932 cm in radius with a density of 7.13 g/cm^3.

The mix-and-match capability allows mixing data tables and physics models for different nuclides and using the data tables to their maximum energy with physics models above the maximum data table energy, even when the maximum energies of data tables for different nuclides differs. Prior to mix-and-match, the only way to model the BGO detector was to substitute some other nuclide for germanium, such as arsenic, As. Furthermore, a data/model cutoff had to be specified, below which all transport was done with data tables and all above which all transport was done with physics models.

In the above BGO crystal neutron flux calculation, the MCNPX mix-and-match capability is compared to the previous unsatisfactory options with 20 MeV and 150 MeV data/model cutoffs:

- ✓ The solid (black) line is the default MCNPX mix-and-match calculation with data tables used for Bi and O and a physics model used for Ge;
- ✓ The dashed (blue) line uses data tables for Bi, As, and O below 20 MeV and physics models for Bi, As, and O above;
- ✓ The dotted (red) line uses data tables for Bi and O up to their maximum value, 150 MeV. The As data table is used up to its maximum value at 20 MeV and then the 20-MeV As data are used above 20 MeV.